In the world of commercial diving, there are numerous types of diving accidents that can occur all too easily, especially if a diving contractor or diver becomes careless. However, in a mature industry such as ours, in most cases we know the pitfalls and how to avoid becoming a statistic. As a company, or as a diver, if you follow the ADCI Standards, the chances of experiencing an accident are greatly reduced.

As an expert witness who works on diving accident cases, I frequently have the opportunity to see the end result of what occurs when somebody makes a mistake or fails to follow the correct procedures in a diving operation. Rarely is a case completely black or white; in most situations, it's a combination of errors that end up causing a diver to be hurt or killed.

The following case is based on a combination of several different diving accidents in which I was involved as an expert witness. The conditions and circumstances have been changed to protect the identities of the divers and companies concerned.

Replacing Anodes on a Platform

A commercial diving company was called out to install replacement anodes on a shallow water platform during the month of January at a remote location offshore. The diving equipment had been previously installed on the rig, and most of the job had been completed, but due to sea conditions, the crew had been sent back to shore by the customer, rather than having them standby during a prolonged period of bad weather.

After a week's delay, the crew was called back out to the rig to complete the job. They flew out in a chopper to the rig at first light and began to set up the work so that they could get a diver in the water as quickly as possible. Although sea conditions were still slightly rough, the maximum combined seas did not exceed five feet. By the time the first diver entered the water, it was just before noon. The crew was composed of six divers.

Prior to the dive, the diver met with the diving supervisor to get his briefing on the work, and the crew reviewed the job hazard analysis. The diver indicated that he was prepared to make the dive and expressed no hesitancy about the sea conditions, the diving system, the crew, or his personal state of fitness.

The following is a description of the work environment, including symptoms and conditions.

The platform was located in a 100 feet of water, and there was still a definite surge at a depth of 30 feet where the diver would be working. The surge pushed the diver back and forth enough that he had to "hog" himself into the structure. The diver's job was to remove the remnants of the old anodes in preparation for the installation of the new ones.

Throughout the dive, the supervisor was in constant communications with the diver and was able to watch his work via the helmet-mounted camera that the diver was wearing. At no time during the dive did the diver complain of any physical discomfort. After a dive that lasted just under three hours, well inside the no-decompression limits, the supervisor brought the diver to the surface to change out divers.

With no stage to hoist the diver out of the water, the diver had to climb a ladder back up to the railing that sur-
The symptoms of decompression sickness may be difficult to differentiate from other diving physiological problems. (© S. Barsky. All rights reserved)

rounded the spider deck just above the water level, and then down over the railing to reach the deck. After the tender removed the diver's helmet, and the diver spoke with the supervisor about the work, the diver suddenly experienced vertigo and collapsed on the steel grating above the water.

Care Following the Incident

Immediately upon his collapse, the diver was carried to the rig infirmary on a stretcher by the other members of the crew and examined by the rig medic. The rig medic suspected that the diver had ruptured his eardrum, but since he was unable to make a definitive diagnosis, he felt the diver needed to be seen by a physician. At no time did the diver undergo a field neurological exam for decompression sickness. Despite his injury, the diver asked to remain on the job, but the supervisor would not allow it.

Arrangements were made to send the diver to shore via crew boat, rather than helicopter. He boarded the crew boat unaccompanied by any crewmember to look after him. After a three-hour trip to shore, the diver arrived at the dock and found no transportation waiting for him so he could receive further medical care. He called the diving company office and was unable to reach anyone who was willing to make transportation arrangements for him to receive medical care.

Eventually, he made his own arrangements back to his home where a doctor at a local clinic saw him. Although he saw several physicians over the weeks immediately following the incident, none of them arrived at a diagnosis of decompression sickness.

Hidden Facts

What the diver did not disclose to the diving supervisor, was that on the day of incident he was taking an over-the-counter decongestant due to a recent cold, and was having difficulty equalizing the pressure in his ears. This fact was revealed in a statement the diver made to one of the physicians he saw on his own following the accident.

The diver further claimed that he was fearful about making the dive, but made the dive anyway because he believed he would be terminated from the company if he failed to dive. There was nothing in the other depositions taken during the case to support the diver's fears of dismissal. The diver had previously shown the strength of character to quit working for three other diving firms prior to the one where the accident took place, because he believed the firms were not promoting him quickly enough. The diver also admitted during deposition that he began to feel poorly mid-way through the dive, yet he never reported this to the diving supervisor.

Analysis of the Case

After analyzing all of the information in the case, the diver probably suffered a "reverse block," where the ears equalize during the descent phase of the dive, but become plugged and fail to equalize as the diver returns to the surface. This usually occurs when a diver has taken some form of decongestant which then wears off during the
dive, causing the Eustachian tube (which leads from the back of the throat to the middle ear) to become blocked with mucous again.

When the diver suffers a reverse block, the eardrum may actually rupture outward, due to the increased air pressure trapped in the ear during the dive. In this case, the diver probably experienced a tear in the eardrum, but because he was wearing a helmet with a head cushion, his ear was insulated from the cold water and he did not experience any vertigo underwater. When his helmet was removed on deck, however, the cold air topside entered his ear and caused nausea and vertigo.

Could the diver have been suffering from decompression sickness as he claimed? Yes, it's possible, and divers do receive what are known as "undeserved hits" (decompression sickness), but in this case, the dive was so far inside the envelope that it appears highly unlikely. Proving or disproving whether a person has suffered from decompression sickness is usually very difficult.

Resolution of the Case

During most lawsuits today, at some time after some of the experts have been deposed, the attorneys on each side will ask their expert to write a report for them regarding their analysis of the case. This report is then made available to the opposing side, and sometimes the judge as well. Although the plaintiff's expert was not a physician, he wrote in his report that the diver clearly suffered from decompression sickness. This was a mistake, since he was not a physician and unqualified to make this type of diagnosis. As the trial date neared, the diver changed his claim from decompression sickness, to "otic barotrauma." An otic barotrauma is defined as any pressure related injury that occurs to the ear, which is a vague and ambiguous claim. An otic barotrauma would not be inconsistent with a reverse block, but also could be caused by eardrum rupture during the diver's descent to the bottom. Damage to the ear can also be caused by an overly vigorous attempt to equalize a Eustachian tube.

On the Monday prior to the trial, the plaintiff's attorney made a settlement offer to the defense attorneys working on the behalf of the diving company. The insurance company, acting on behalf of the diving company, settled the case for an amount that will buy the diver a really nice pickup truck and little more, after the plaintiff's attorneys take their cut.

Lessons to Be Learned for Divers

- If you have any medical problems while on a job, you must disclose them to the diving supervisor and allow him to make the decision regarding whether you are fit to dive or not.
- If you have any hesitancy about making a dive, or feel the conditions are unsafe, it is your duty to refuse to dive, even if you think you might be fired for refusing to dive. In my personal experience, the three times where I refused to dive until weather cleared or equipment was brought on site, I never experienced any threat of termination. In this case, the diver had a wife and three children for whom he was responsible. In a worst-case scenario, it's better to be dismissed from employment than to experience a debilitating injury or death.
- Always carry and maintain your own diving logbook. This is an ADCI requirement and will help you to document what you have done and experienced. The diver in this case thought the logbook was an option and was unable to produce one when deposed.

Lessons to Be Learned for Diving Companies

- The diving supervisor should always perform a field neurological exam on every diver following every dive, even on dives that are allegedly "no-decompression" excursions. This is a quick and easy examination that takes only a few minutes, yet helps to ensure the safety of your crewmembers. Divers can and do experience "undeserved hits" that are hard to explain from a physiological perspective.
- Always have a way of hoisting the diver out of the water in the event that he is injured and be prepared to put that equipment into play on a moment's notice. If this diver had experienced vertigo while he was still in the water, the results could have been catastrophic.
- In the event that you have a diver who is injured while offshore, or at any remote location, that person should be sent to seek medical aid accompanied by a member of your team who can attend to his needs and assist him. If your diver develops symptoms of decompression sickness during transport, only another diver may recognize the problem and know what action must be taken.
- Treat your employees the way you would want to be treated in the event of an injury. Make absolutely certain that there will be someone waiting to assist them when they come ashore, particularly if they make land in a remote location.
- Be sure your paperwork is thorough and fully completed. In this particular case, the diving company used a dive log that did not provide sufficient information on each individual dive. Your logs are legal records and also provide a comprehensive record for billing your customers.
Diver medical technicians (DMTs) and hyperbaric physicians are the best qualified people to make a proper diagnosis if there is any doubt about the condition of an injured diver. In the event of a suspected case of DCS, get a medical diagnosis as soon as possible. (© S. Barsky. All rights reserved.)

At a minimum, the individual dive log should include the following information:

1. Exact geographic location of the dive (possible now with today's GPS units)
2. Date and time of day the diver entered the water
3. Name of the diver, supervisor, rack operator, tender, and standby diver
4. Name of the customer and the installation where the work is taking place
5. Equipment worn by the diver, including serial number of the helmet.
   (This information will be critical in a serious injury or fatality.)
   a. Purpose of the dive
   b. Tools used during the dive
   c. Work performed during the dive
   d. Breathing gas supply pressure
   e. Decompression/ascent time
   f. Decompression tables used and repetitive group following the dive
   g. Results of the field neurological exam

With an incomplete dive log, it becomes very difficult to reconstruct what happened, when it happened, and who did what.

- Always insist that every diver in your company keeps and maintains an ADCI approved logbook. This is an essential document you will want to examine whenever you hire a diver, and it is critical as a legal record should an accident take place.
- When in doubt following a diving accident, always have your diver examined by a diver medical technician or a hyperbaric physician to help arrive at a qualified diagnosis.

As a diving contractor, your best defense is to follow the ADCI Standards, and to ensure you are in compliance with Federal and/or State labor regulations, such as OSHA or the U.S. Coast Guard, depending on where your job takes place. Nobody wants to see another person get hurt, and your job as a diving contractor is to help prevent that from happening.